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EFFECTS OF CLEANING IN A REPRODUCTION STAND OF WESTERN WHITE PINE AND ASSOCIATES

By

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The chief purpose of intermediate cuttings[1/] in the western white pine region is to increase the value of the stand at the time of final harvest. As these cuttings remove material of poor quality and small size, material which is seldom if ever salable in this region, they must be made at an outright expense. Consequently, it is particularly important to favor methods which produce the greatest increase in stand value per dollar expended. Cleanings or weedings, i.e., the cutting of undesirable trees in young stands to favor valuable trees, applied in reproduction about 5 to 20 years of age, seem to promise the maximum returns for the expenditure of any cutting method so far tested. At this early age the density and species composition of the stand can effectively be altered to favor the most valuable species, western white pine, at less cost than at any other age.

Results on three cleaning plots established in 1935 in the Upper West Branch drainage of Priest River in the Kaniksu National Forest, Idaho, and remeasured in 1939, give a good example of the possibilities of this type of stand improvement in western white pine. These plots test the freeing of white pine reproduction from competing western larch and lodgepole pine. They were established in dense reproduction, averaging

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1/ Intermediate cuttings are all cuttings made in a forest between the time of its establishment and its final harvest.

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8 years in age, which originated following a 1926 burn. Total number of trees per acre at the time of cleaning ranged from 9,000 to 21,000 with an average of 13,000. Average composition of this stand is given in table 1.

Table 1.--Species composition of total stand before cleaning

Species	Percent of total stand
Western white pine	5
Western larch	45
Western hemlock	25
Western red cedar	15
All other species	10
Total	100

Although white pines were adequate in number for satisfactory stocking, they were badly overtopped and crowded by other species, especially larch (see plate 1, B and F). A cleaning or weeding was obviously necessary if the future stand was to contain a satisfactory proportion of the valuable white pine.

Treatment on the three plots, each 0.4 acre in size, was as follows:

Plot 165 - Moderate cleaning. All white pine and cedar were left. Engelmann spruce and Douglas fir were cut only when crowding white pine. All larch within 8 feet of white pine were cut. In the absence of white pine, smaller larches were left with an 8-foot spacing.

Plot 166 - Untreated check plot.

Plot 167 - Heavy cleaning. All reproduction except that of white pine and cedar was cut.

The plots were cleaned by CCC enrollees using hand pruners. Trees were cut close to the ground. Only reproduction over 0.5 foot in height was cut in cleaning or considered in stand tallies. Although figures of the labor required for this job were not kept, cleanings similar to these have required from 1 to 5 CCC man-days per acre.

Results of the cleaning in releasing pine are best shown by studying the dominant trees. The tallest tree on each milacre (6.6 by 6.6 feet square) unit of area was considered the dominant tree for that unit, and the sum of these milacre dominants on 336 milacres within each plot was assumed to make up the dominant stand. How cleaning changed the composition of this stand is shown in table 2.

Table 2.--Effects of cleaning on composition of the dominant stand

Species	Composition of dominant stand							
	Plot 166 untreated check		Plot 165 Moderate cleaning			Plot 167 Heavy cleaning		
	1935	1939	1935 before cleaning	1935 after cleaning	1939	1935 before cleaning	1935 after cleaning	1939
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Western white pine	1	1	1	45	19	9	70	38
Western larch	90	88	96	35	66	80	0	32
Lodgepole pine	9	10	1	0	1	4	0	1
Western red cedar	0	0	0	10	3	2	30	16
Others	0	1	2	10	11	5	0	13
All species	100	100	100	100	100	100	100	100
Basis number trees	336	336	334	284	322	322	219	309

The moderate cleaning given plot 165 increased white pine in the dominant stand from 1 percent before cleaning to 45 percent after cleaning. The increase on the heavily cleaned plot was greater, from 9 to 70 percent. It is evident that cleaning was very effective in changing the position of white pine from one of subordinance to a position of dominance.

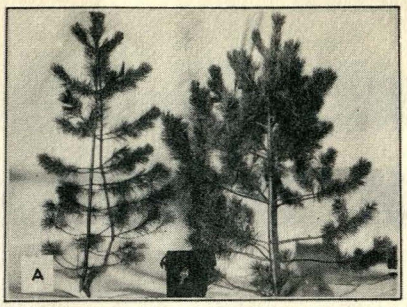
During the 4-year period after cleaning, white pine lost ground to western larch. Small larches left in cleaning and trees of this species less than 0.6 foot in height in 1935 have shown remarkable height growth, often overtopping pine (see plate 1, E). This is not as serious, however, as the figures in the foregoing table might indicate. Formerly each pine had to compete with many larches; now, with relatively few. Pine, though light demanding, is able to survive and develop when in a subdominant position so long as it is not completely overtopped as in plot 166 (see plate 1, B and C). Larch, however, is very intolerant and can survive only if it maintains a dominant position. Thus, though table 2 shows that white pine has lost ground in the dominant stand, it has not lost much ground in the total stand. A second weeding might profitably be done on plot 165, but even without such a weeding the white pine on this plot and those on the heavily cleaned plot, 167, have room for development and have a good chance to form a satisfactory proportion of the future stand.

The greatest effect of the cleanings on development is shown in comparisons of amount and color of foliage and diameter of stems between trees of untreated and cleaned plots. White pines on untreated plot 166 are slender with rather thin, dark-green foliage. Those on the two weeded plots are more stocky with dense blue-green foliage. A few measurements of foliage density show that pines on weeded plot 165 had approximately one-half again as much foliage, based on oven-dry weights, as those on untreated plot 166 (see plate 1, A). This relationship of 1½ to 1 held for diameters of stems measured 1 inch above ground line. No difference in height growth for the 4 years showed up between white pines of untreated and treated plots, but a real height difference is almost certain to result in the future.

Although the outcome of these cleanings cannot be predicted with certainty, it seems within reason to believe that the proportion of white pine in the untreated stand at maturity will not be greater than 30 percent while the moderate cleaning should increase this proportion to approximately 50 percent and the heavy cleaning to 70 percent. These figures take on added meaning when interpreted in terms of dollars. With a total yield at maturity of 40,000 board feet per acre and with a stumpage-price differential between white pine and other species of $5 per thousand in favor of pine, the moderate cleaning would increase the gross returns from stumpage by $40 per acre and the heavy cleaning by $80. These increases will more than repay the investment in cleaning and a reasonable rate of interest on the investment.

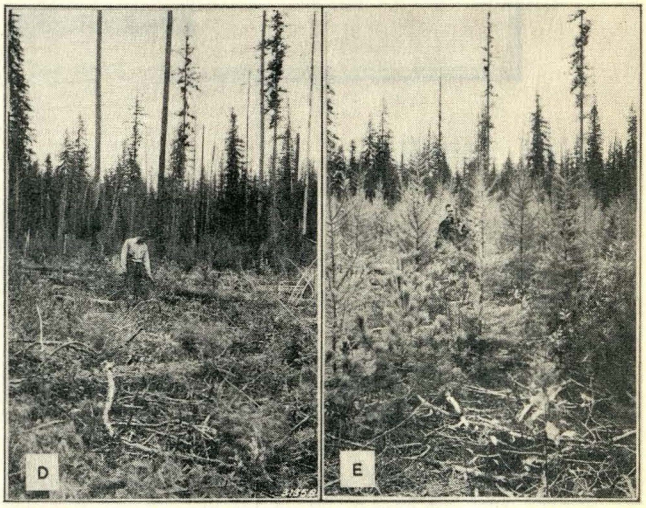
Obviously, returns are greatest when cleanings effect the greatest release of the valuable species. In stands such as that of plot 166 where white pine is badly crowded and dominated, cleanings can be very effective. If white pine already dominates the stand, cleanings are of little value except as they may be beneficial in altering stand density to allow greater growing space for individual trees.

All tests to date speak well for this type of stand improvement work in the western white pine region. Cleanings are one of the cheapest of stand improvement measures and they appear also to be one of the most effective and to offer the greatest returns for the expenditure of any cutting method so far tested.

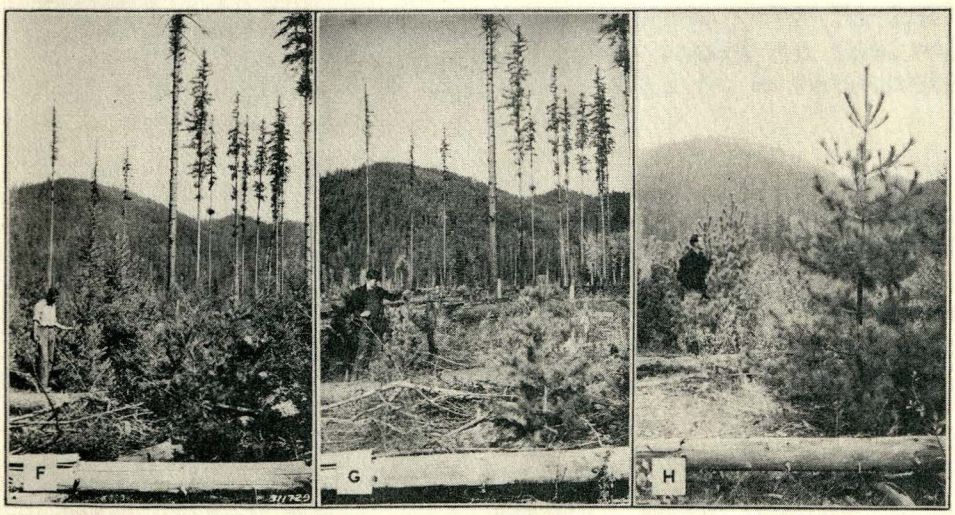


EFFECTS OF CLEANING ON DEVELOPMENT OF WESTERN WHITE PINE: LEFT, TREE FROM UNTREATED STAND; RIGHT, FROM STAND CLEANED FOUR YEARS PREVIOUSLY.

B—UNTREATED STAND, EIGHT YEARS OF AGE. WHITE PINE (IN MAN'S HANDS) DOMINATED BY WESTERN LARCH. C—SAME STAND FOUR YEARS LATER. WHITE PINE INCREASINGLY DOMINATED BY LARCH. (PLOT 166)



D—IMMEDIATELY AFTER MODERATE CLEANING TO RELEASE PINE. E—SAME STAND FOUR YEARS LATER. LARCH TREES LEFT IN CLEANING HAVE MADE RAPID GROWTH, PINE, HOWEVER, STILL HAS ROOM FOR GOOD DEVELOPMENT. (PLOT 165)



F—UNTREATED STAND. WHITE PINE DOMINATED BY LARCH. G—SAME STAND IMMEDIATELY AFTER HEAVY CLEANING. TO RELEASE PINE. H—SAME STAND FOUR YEARS LATER WITH PINE SHOWING EXCELLENT DEVELOPMENT. (PLOT 167)

PLATE 1. CLEANINGS IN YOUNG STANDS OF WESTERN WHITE PINE AND ASSOCIATES.